HANDBOOK

FOR THE USE OF TEACHERS CONDUCTING CLASSES IN

HEALTH

BY

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WALLER HIGH SCHOOL, CHICAGO

ALLYN AND BACON

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HANDBOOK

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INTRODUCTION

This handbook is designed as an aid to teachers. No matter how able a teacher is, his time will be economized and his work more efficient if he has at hand the plans and details of procedure which have been worked out by other teachers in many years of practice. He will use the achievements of others, so far as they are in harmony with his own aims, as building stones in the construction of his own edifice. We must all build with the materials on which others have labored. The writer hopes his fellow teachers will find this handbook useful in some such way.

No reading text can be all a pupil needs in the study of any science. The text must be supplemented not only by the stimulating and guiding influence of the teacher and fellow pupils, but also by many demonstrations and practical experiments. Without these the study of the text is too often a repetition of empty words. The things mentioned in the text should be seen and handled, the processes should be observed so far as possible, that the pupils may have concrete

images to give substance to the words of the text. This handbook, together with the pupil's note-book, gives directions for many carefully worked out demonstrations and practical exercises.

Of course the best work can be done in a well-equipped laboratory, but no teacher should omit this essential work because of the lack of a laboratory. The experiments of greatest value to the pupil can be done at very little expense in an ordinary schoolroom. We sometimes forget that for the study of health we have always with us the object of study, the human body. We must constantly direct the pupil's study to his own body.

The practical exercise which the pupil does himself is of the greatest value to him. Therefore he should be given things to study and experiments to do at his own desk. But it is not feasible to equip every pupil with supplies and apparatus for all the experiments that can profitably be done by the class. Some things can be shown and some processes demonstrated at the teacher's desk, with the class as observers. Such demonstrations, when not too difficult, should be done by certain pupils coached by the teacher. Only the more delicate operations should be done by the teacher himself.

Another method of managing the practical work, a method well adapted to high school conditions, is the group method. Four to six pupils are put into each group. They are given the supplies and apparatus needed and they work together on the problem. Of course there will be considerable talk among the co-

workers, and they will have to exercise some self-restraint to avoid disturbing other groups.

The library is allied to the laboratory, the methods of work are much the same. The teacher of health should make use of reference books, charts, and all sorts of printed material and samples. Suggestions are made in the pages that follow about collecting useful material other than reference books, — advertising matter, samples, pictures, etc. — which can be used by the pupils in studying topics on which they are to report to the class.

Without trying to throw all the study into formal "projects," teachers will find that the project method will enrich the study in almost every chapter. Among the most attractive projects are surveys and investigations. In the pages that follow, suggestions are made for various investigations, such as investigations of methods of ventilation; of the markets; of packing foods; of sewage disposal; of water supplies; of hospitals, clinics, nursing, boards of health; of the extermination of flies, mosquitoes, and other pests; of superstitions regarding health; of the use of "patent medicines"; etc.

Graphs are so much used in representing relative quantities in a striking way that the pupil should be taught to read them easily. He can learn best by making graphs to express some things he wishes to exhibit. Detailed directions for graphs are given on page 29.

To make a record and so to fix in the mind of the pupil all this work outside the text-book, a note-book

is essential. Keeping a note-book should not be copying, in beautiful handwriting, instructions the teacher dictates. It should not be copying elaborate drawings from books or charts. It should not be a task in writing English — complete sentences with the utmost care to rhetorical form. Such note-books are heartily disliked by progressive pupils and tend to make the subject a bore.

On the other hand, the note-book is the pupil's pride and joy when he sees that it is an important part of the work he enjoys and does well. A good note-book should be a record, neat and clear, of what the pupil gets outside the text-book and wishes to keep. It should contain outline sketches and diagrams not in the text-book, a concise record of the pupil's laboratory work, library studies, investigations, graphs, and score cards. The pupil should watch the papers and magazines for articles on health and make clippings which should be inserted in their proper places in the note-book. Illustrations, photographs, picture cards, cuttings from advertisements — all these add to the value of the note-book.

Teachers whose work is heavy can not read the note-books carefully and correct all the mistakes. They should be frank with their classes and make this point clear. The topics written up in the note-book should be discussed in class and the pupils allowed to correct their own mistakes. If a teacher's work is so light that he can carefully correct every note-book he may very well mark all errors in spelling and in English, note any lack of neatness, and correct any mistakes of state-

ment. Every teacher should take time to check up occasionally, especially in the earlier part of the semester, to read pages here and there, to note incompleteness, inaccuracy, and gross lack of neatness. He should never fail to commend highly the good work. Pages that are too poorly done should be returned for improvement before they are accepted. To this end a loose leaf form of note-book is convenient.

The teacher will need to employ every device he can to keep the work of checking up from becoming so burdensome that he can not do it. One scheme is to have the pupils observe uniformity in the arrangement of the page. Thus the teacher can see at a glance whether the topic or sketch is done satisfactorily, or poorly, or is omitted. The note-book which the writer has prepared to supplement HEALTH offers this advantage. Of course the exercises which the pupil has more freedom in planning, such as investigations and individual reports, will have a corresponding freedom in the form of their record.

One of the most effective ways of driving home a lesson is to dramatize it. Pupils are always eager to take part in a dramatic presentation. Each class will supply a number of boys and girls who will memorize the words of a prepared dialogue and rehearse their parts, then give the play before their class or before a group of all the health classes of the school. After one or two plays have been given and some pains taken to stimulate interest in the work, a few pupils will be found who will coöperate with the teacher in writing new plays to enforce certain lessons. The writer, with

more or less assistance from his pupils, has prepared several playlets which he will be glad to send to other teachers at the cost of typing. Their presentation takes fifteen or twenty minutes each. The following have proved interesting:

A Fool for His Doctor; 4 girls, 1 boy; the use of "patent medicines."

The Quilting Bee; 5 girls; keep quarantine, use of antitoxin.

Ready for Camp; 4 boys, 1 girl; value of vaccination.

At Camp Canoe; 7 boys; care of camp, artificial respiration.

The Boys at Maple Point; 5 boy scouts; care of camp, dressing wounds.

The Scientific Way; 5 girls; dressing a wound.

The Dance of the Blood; 26 girls; a pageant in costume, dancing, singing round.

It may be of some use to tell pupils what to do in an emergency, how to render first aid, how to relieve pain, how to treat petty injuries. But what you tell does not stick very well. The pupils should practice the thing. Antiseptics of various kinds should be brought into class and the pupils directed how to make solutions of them and use the solutions right there. The teacher should demonstrate bandaging an arm, or a finger; then let each pupil practice on his neighbor. Each pupil should go through the operation of removing a cinder from the eye, of pulling out a sliver, of relieving earache and toothache, of taking temperature and pulse, of producing artificial breathing.

The great aim of our health classes is to establish in our pupils habits which are conducive to health, correct habits founded on understanding, — habits of breathing, drinking, eating, exercise, dress, toilet.

The school can not hope alone to train every boy and girl to correct ways of living, but the school can do very much to lay a good foundation in the understanding and can also arouse considerable coöperation in the home in establishing good habits in the pupils.

The pupil's weight is a fair index of his nourishment. He is eager to have his weight taken every month, every week if necessary, and to consult about his diet and other habits with a view to bringing his weight up to normal if it is below. Details for this work are given in connection with the problems on food.

The score card is a great help to a pupil in his effort to hold himself to a practice until it becomes a habit. In making the card the pupil should select, with the advice of the teacher, from the many hygienic habits he ought to establish, three or four items. Among the most important are care of the teeth, bath, bowel movement at regular times, no eating between meals except a determined lunch, nine (or ten) hours sleep, exercise in the open air. The pupil should be advised to make the list short. If he has too many items, attention to them will become burdensome and he will neglect them. Every day or every week the pupil should make a score mark after each item. A little attention to score cards will arouse keen interest in them. The pupil will be eager to show a perfect score at the end of the month. After a few practices have become well established as habits new ones may be taken up.

The score card is used also in making records of investigations. It serves as an outline of points to be

observed. Here, too, caution must be observed not to make the card too long. Every item on it must have a clear value in the mind of the pupil and the questions on it must not be too difficult for him to answer. For examples of score cards see pages 49 and 60 of the pupil's note-book.

The following reference books are recommended for a class library. They will be referred to by number in the suggestions for library work.

1. A Layman's Handbook of Medicine, with Special Reference to Social Workers. 523 pp. 1916. Richard C. Cabot, M. D. Houghton Mifflin Co.
2. Pathfinders in Medicine. 317 pp. 1912. Victor Robinson. N. Y. Medical Review of Reviews.
3. An Introduction to the History of Medicine. 943 pp. 1921. Fielding H. Garrison. Saunders.
4. Medical Science of Today. 320 pp. 1912. Willmott Evans. Seeley, Service & Co., London.
5. The Romance of Medicine. 312 pp. 1917. Donald Campbell Macfie. Cassell & Co. N. Y.
6. Walter Reed and Yellow Fever. 288 pp. 1906. Howard A. Kelly. McClure, Phillips & Co.
7. Malaria, a Neglected Factor in the History of Greece and Rome. 103 pp. W. H. S. Jones. 1907. Macmillan.
8. The Prevention of Malaria. 669 pp. 1910. Ronald Ross. Dutton.
9. A Plea and a Plan for the Eradication of Malaria throughout the Western Hemisphere. 65 pp. 1917. Frederick L. Hoffman, LL. D. Prudential Press, Newark, N. J.
10. Mosquitoes, How They Live, etc. 240 pp. 1901. L. O. Howard, Ph. D. McClure, Phillips & Co.
11. Smallpox, Its Prevention, Restriction and Suppression. 1907, 1912. Illinois Board of Health, Springfield, Ill.
12. Smallpox and Vaccination in Europe. 1902. Ed. J. Edwards, M. D. H. K. Lewis, London.

13. The Narcotic Drug Problem. 165 pp. 1920. Ernest S. Bishop, M. D. Macmillan.
14. The Physical Effects of Smoking. 188 pp. 1917. G. L. Fisher and Elmer Berry. Association Press, N. Y.
15. Alcohol, How It Affects the Individual, the Community and the Race. Henry Smith Williams. 150 pp. 1909. Century.
16. Standardization of Medical Inspection Facilities. J. H. Berkowitz. Bureau of Education, Bulletin 2, 1919. Washington.
17. The School Nurse. 293 pp. 1917. Lina Rogers Struthers, R. N. Putnam.
18. Health and Medical Inspection of School Children. 614 pp. 1912. Walter S. Cornell, M. D. F. A. Davis.
19. The Posture of School Children. 322 pp. 1913. Jessie H. Bancroft. Macmillan.
20. Posture in School Hygiene. American Posture League. New York City.
21. From School to Work. Margaret H. Abels. U. S. Government, Washington.
22. Work of School Children during Out of School Hours. C. D. Jarvis. Washington.
23. Nostrums and Quackery, Vol. 1, 1912, Vol. 2, 1921. American Medical Association, 535 N. Dearborn St., Chicago.
24. The Great American Fraud. 185 pp. Samuel Hopkins Adams. American Medical Association.
25. The Healthful Farmhouse, by a Farmer's Wife. 1906. Helen Todd. Whitcomb & Barrows, Boston.
26. Euthenics. 1912. Ellen H. Richards. Whitcomb & Barrows.
27. Domestic Water Supplies for the Farm. 108 pp. 1912. Myron L. Fuller, S. B. J. Wiley & Sons, New York City.
28. Appleton Home Books, Vol. 1, Building a Home.
29. Appleton Home Books, Vol. 2, Home Grounds. Appleton.
30. Sanitation of Public Buildings. 235 pp. 1907. William Paul Gerhard, C. E. John Wiley & Sons, New York City.
31. Municipal House Cleaning. 232 pp. 1918. Wm. Parr Capes and Jeanne D. Carpenter. Dutton & Co.

Among the magazines that help our work are *The American City* (N. Y.), which discusses city planning and zoning, *The Survey* (112 East 19th St., N. Y.), which discusses especially the social phases of health, and *Hygeia* (535 N. Dearborn St., Chicago), which is concerned more with personal health. Many of the health articles in newspapers and popular magazines contain valuable material. (See the reviews in *Hygeia*.) But some of these articles are not trustworthy. We must be especially cautious about accepting the statements in special cult publications.

In addition to the purchased books the library can be enriched by free material from the advertising departments of various food manufacturers and drug firms. For example, the Bowman Dairy Co., Chicago, puts out a little magazine, *Milk*, which contains reliable and enlightening articles. The millers of Minneapolis have interesting material on wheat and flour. The large packing houses (Armour, Wilson, and others) have much good material; write to their publicity department. Manufacturers of antitoxins and vaccines have some very interesting descriptions of their farms and laboratories. — Lederle Antitoxin Laboratories, N. Y. C.; E. R. Squibb & Sons, N. Y. C.; Pasteur Institute, 812 N. Dearborn St., Chicago; Prudential Insurance Co. of America, Newark, N. J.; The Palisade Manufacturing Co., Yonkers, New York; United States Standard Serum Co., Woodworth, Wisconsin.

From the advertising columns of medical magazines, which your physician will lend you, get the addresses

of large hospitals and sanatoria and write to them for descriptive circulars.

Associations and leagues for the improvement of health or morals do a great deal to help teachers. They usually have pamphlets and serial publications which are sent at cost price to those asking for them. Among them are:

A. The Scientific Temperance Federation, 73 Tremont St., Boston.
B. The Anti-Cigarette League, 58 W. Washington St., Chicago.
C. The National Child Labor Committee, 1230 Fifth Av., New York City.
D. The National Board of Y. W. C. A., 600 Lexington Av., New York City.
E. American Social Hygiene Association, 370 Seventh Av., New York City.
F. American Genetic Association, Washington, D. C.
G. National Safety Council, 166 N. Michigan Boul., Chicago.
H. Elizabeth McCormick Memorial Fund, 848 N. Dearborn St., Chicago.
I. American Posture League, New York City.

The United States government publishes such a quantity of material of value to the student of health that it is impracticable to list here those books which should be in the class library. The teacher should send to the Superintendent of Documents, Washington, for price list 51, Health, covering the topics of disease, drugs, and sanitation. From this list books touching the points most interesting to the class can be ordered. Books should be ordered from the Superintendent of Documents by both title and number and paid for by money order in advance. A few samples are named:

Road to Health, 16 pp. 1919, 5 cents, T27.22:1.
Adenoids, 7 pp. 5 cents, T27.22:2.
Harmfulness of Headache Mixtures, 60 pp. 10 cents, T27.3:53.
Health Education Series (10 numbers) 5 cents each and 2 cents for additional copies. I16.29:
No. 2, Diet for the school child, No. 5, Child health program for parents-teachers associations and woman's clubs, No: 7, The lunch hour.
Hygiene of rural schools, 5 cents, T27.6/a:219.
Good Teeth, T27.6/a:707 also T27.22:13. 5 cents.
Good water for farm houses, 5 cents, T27.12:70.
Colds, 5 cents, T27.6/2:30.
Exercise and Health, 5 cents, T27.6/2:24.

State and municipal governments, through their Boards of Health or of Public Works, publish much that is valuable to health classes. A letter to the state capitol or to the municipality will usually bring the desired material. Illinois and Wisconsin have good studies of state water supplies. Of the cities, Los Angeles, New York, Chicago, and Cincinnati represent the chief types of water supply for large cities.

The following firms are reliable dealers in supplies and will furnish nearly everything needed in the laboratory except the fresh material:

Central Scientific Co., 460 E. Ohio St., Chicago.
Chicago Apparatus Co., 32 S. Clinton St., Chicago.
Scientific Equipment Co., 70 Fifth Av., New York City.
Mr. Charles A. Mills, 461 Market St., San Francisco, Cal.
Mr. H. V. Cadwell, 691 Merrick St., Detroit, Michigan.
Mr. J. H. Wilson, 5 Thorburn Av., Toronto, Ontario, Canada.

CHAPTER I

LIFE

In order that our effort to maintain health may be rational we must understand the normal working of the body. Our first study, then, will be the chief activities of the body, or, reduced to its lowest terms, the activities of the living substance, protoplasm. That it may keep up these activities protoplasm needs certain things and conditions. To supply these needs every part of the body coöperates. Thus the body is an organic unit, every part doing its particular work toward the general end of providing for the needs of all.

The study becomes, therefore, a series of problems for the pupil to work out, — what needs arise from the fundamental activities of protoplasm, and how is each of these needs supplied. If the teacher accepts this scientific and pedagogical approach to the subject, he will take great pains to see that each pupil gets the statement of the problems clearly in mind. The whole development of the physiologic foundation of the study of health depends on an understanding of these problems.

Such fundamental processes as assimilation and oxidation (synthesizing foods in building up the cells, and breaking down cells in the activities of mind and muscle) can have no clear meaning to one who knows nothing about chemical changes. Most pupils enter-

ing high school have no such knowledge. Therefore a little preliminary instruction on atoms and molecules must be given. The few paragraphs in the text may well be supplemented by practical experiments and demonstrations. Detailed directions for a few exercises are given in the following pages and in the note-book. Since first year high school pupils are usually not trained in laboratory work it is desirable for the teacher to discuss pretty carefully each exercise as it is done. The pupils need the help. When they become accustomed to the work they can be more self-reliant.

To give the pupils a first-hand acquaintance with elements which are frequently mentioned in the text the teacher should show them a few of the common elements. (See note-book, page 1.) The group method of work is recommended. Before class time as many sets of the specimens named in the note-book should be prepared as there are groups working at one time. Each specimen should be clearly labeled. After fifteen minutes study the pupils should report on their observations.

The exercise on synthesis of elements is to illustrate the union of elements to form compounds. (Note-book, page 3.) The pupil must get a clear understanding of the difference between a mixture of substances, a mingling of their particles, and a compound, which is produced by a chemical union, the molecules of the substances being broken up and new molecules formed from the constituent atoms. Section A may be either group work or demonstration. If the class works in

groups, the teacher may well help them by giving oral directions, insisting on prompt and accurate action, a designated pupil in each group doing the work. The more striking experiment (B) producing zinc sulfid should be done at the teacher's desk as a demonstration.

The purpose of the next experiment (Note-book, page 5) is to show that a compound can be broken up into the elements of which it is composed. It may be done in group work or as a demonstration.

The four gases oxygen, hydrogen, nitrogen, and carbon dioxid are repeatedly mentioned in our study. Our experiments with them should bring out distinguishing features of each as well as give concreteness and reality to things that seem to children rather unsubstantial. The experiments can be done most feasibly as demonstrations. (Note-book, pages 7 to 14.)

FIGURE 1. — ONION SKIN CELLS.
Seen with a hand lens.

In addition to studying the figures in HEALTH, pages 7, 9, and 19, the pupils should handle specimens of plant and animal tissue and see under the microscope the cells of which in part the tissue is composed. Most animal cells are too small to be seen clearly by pupils unaccustomed to a compound microscope, therefore this study should begin with large vegetable cells. A convenient object to handle is the onion skin. (Note-book, page 15.) The work should be individual.

With a hand lens the pupils will barely make out the cell structure of the onion skin. They should see the

same object under greater magnification to bring out the nucleus and the clear outline of the cells. Therefore the teacher should give a demonstration with the projecting microscope, or, if the pupils have learned to use the instruments, they may be supplied with individual compound microscopes, but it is hardly advisable to take time to teach the use of the compound microscope in this course. The specimen should be stained with dilute iodine to bring out the nucleus.

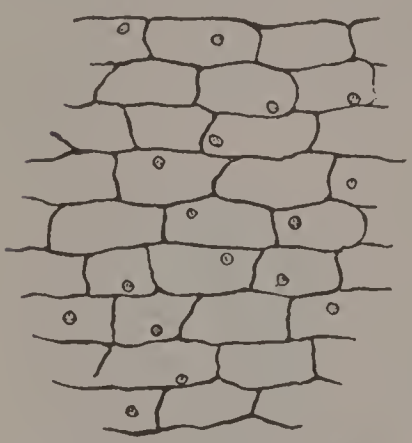

FIGURE 2. — ONION SKIN CELLS.
Seen with a compound microscope.

A valuable extension of this demonstration is the exhibition with the projecting apparatus of a number of permanent mounts of vegetable tissue. There should be a short discussion of each slide without taking time for drawings. A most attractive exhibit is a slide of live infusorians, some large like the paramecium. It shows moving protoplasm, drives home the lesson as nothing else will, and never fails to "bring down the house." A hay infusion a week or two old will supply the material.

To give the pupils clear images of the tissues named in HEALTH, page 8, get from the butcher pieces of the tissues named in the note-book, page 17, cut each into as many pieces as you have groups and give each group a set of specimens, each specimen named. Directions are in the note-book.

CHAPTER II

THE BODY AT WORK

In writing a text-book the vexing question arises, In what order shall I take the topics? The topics are so closely inter-related that whatever is taken first will depend for its complete understanding on something that follows. The writer of Health has followed the plan he has come to adopt after years of practice with his classes. He helps the pupils first get a general understanding of the body as an organism and of the functions of its various organs and apparatuses. Then it does not matter so much in just what order the parts of the body are taken up for detailed study; there is in the background an understanding of the relation of each part to the whole. Chapter II of Health gives this general survey of the human organism. It is the physiological foundation on which rest the studies of hygiene which follow.

Section 1. Movements

Even many high school pupils are profoundly ignorant of the structure of the body. Therefore the teacher will find it profitable to spend one or two periods on the framework of the body, keeping in mind the relation of the frame to the parts it supports. To supplement the text there should be a mounted skeleton and, for the use of the pupils at their own desks, separate

bones, especially a skull or two, and several thoracic and lumbar vertebræ. Detailed directions for individual work are given in the note-book, page 19.

To reënforce the thought that bone is alive and to show the details of its make up, the teacher may well set up a compound microscope showing a bone section. Pupils come one at a time while the remainder of the class are doing the other work and study the specimen. They can easily see the canals and the tiny irregular spaces (lacunæ) which in life were occupied by blood vessels and cells.

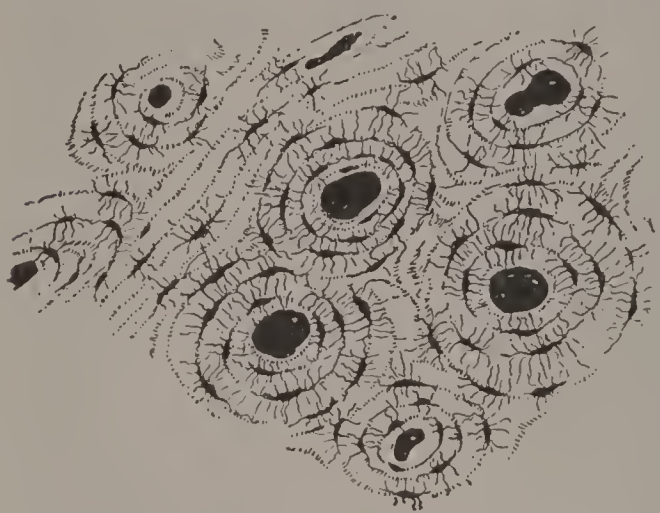

FIGURE 3. — A CROSS SECTION OF BONE TISSUE.

Seven blood canals are shown. Around them, in concentric rings, are the lacunæ which contained the bone cells. The finest lines are canaliculi, minute tubes which connect the cells with one another and the blood canals.

The study of tendons should be done as group work, unless the quantity of material available makes individual work possible. Get from the butcher the feet of fowl and sheep shanks, enough to supply each group. The pupil's directions are in the note-book, page 25.

The supplementary study of muscles divides into two parts, (a) the examination of specimens of muscle and (b) the study of the pupil's own muscles. For individual study give each pupil a small piece of lean

meat with noticeable connective tissue and fat in it. The pupil's directions are in the note-book, page 27.

If a piece of stomach or intestine or heart can be obtained from the butcher it will show muscle of a different kind. For demonstration the teacher can prepare a slide by tearing a bit of muscle with needles, and show it under the microscope. Also, by pulling off the wing or the leg of a dead insect, fragments of muscle can be obtained which show the fibers under the microscope.

Pupils should be cautioned in studying their own muscles not to mistake tendons for muscles. Muscles are soft when relaxed and get hard when contracted. Tendons are always hard and are usually long narrow cords. If the movements designated in the note-book are made against a resistance, the muscles stand out better.

Section 2. Food

In connection with Figure 14, HEALTH, page 21, show the pupils the actual gastric glands. Get a pig stomach from the butcher. Turn it inside out and rinse the mucous membrane. Cut it into pieces about an inch square and preserve them in dilute formaline, 3 to 5 per cent. Before class rinse the specimens thoroughly in water. To show the glands clearly the specimen should be a little dry and the light just right. The compound microscope used should be low power, $\frac{1}{2}$ in. or $\frac{3}{4}$ in. objective, the light reflected. (Note-book, page 29.)

The discussion of glands will bring out the point that if a certain fluid comes out of a gland the material from which it is made must first go into the gland. Of

course blood plasm is the raw material from which each gland secretes its particular fluid.

The liver and pancreas are good examples of glands with ducts to carry their secretions to the place where it is to be used. Specimens obtained from the butcher show the appearance of the tissue, but the connecting tubes are trimmed away. The blood vessels and ducts of these glands can be shown in an animal's dissected body. The dog or the cat is a suitable animal for such demonstration, but in some states this use of these pets is forbidden by law.

FIGURE 4. — SHEEP'S LUNGS.
Dorsal View.

When the class is studying page 22 of HEALTH exhibit a specimen of solid glucose and also a clear glucose sirup such as Red Label Karo. Other experiments and demonstrations on food and digestion are discussed in Chapters IV and VI.

Section 3. Oxygen

Though the pupils are familiar with the word lungs they have no idea what the organs are like. There-

fore they should spend about twenty minutes examining them. Show the pupils how to distinguish the dorsal side of the lungs, which is entire and has room for the backbone between the two lungs, from the ventral side, which is lobed. (Note-book, page 31.)

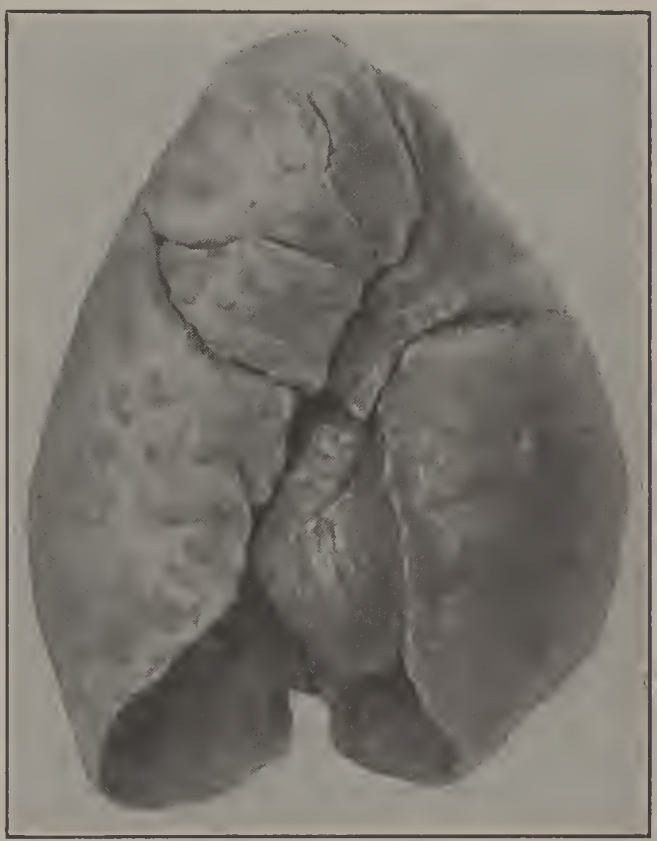

FIGURE 5. — SHEEP'S LUNGS AND HEART. Ventral View.

Section 4. Transportation

It is desirable that the pupils see the blood under a compound microscope, $\frac{1}{6}$ or $\frac{1}{8}$ inch objective. The teacher will prepare the instrument and the pupils come one at a time to look at the specimen while the other members of the class are otherwise engaged.

No class that has the use of a compound microscope can afford to miss a view of blood circulating through capillaries. The writer has found the tail of a bull-frog tadpole a very convenient specimen. Even better is the gill of a very young salamander tadpole. Directions are given in the note-book, page 33.

Take considerable pains in tracing the course of the blood in the diagram in HEALTH, pages 29 and 113.

Nearly all pupils have very inaccurate notions of the course the blood takes. A large copy of the diagram might be put on the board and one pupil after the other asked to trace the course of the blood from the heart to the various organs and back to the heart.

Section 5. Elimination of Wastes

Laboratory work is given in Chapter IX.

Section 6. Regulation of Temperature

A good demonstration of the fact that evaporation of liquids from the surface of the body cools the skin can be made by using ether, alcohol, or gasoline. Let a pupil go along the aisle with a medicine dropper and put a drop of water on the hand of each pupil. Another pupil should follow and put a drop of rapidly evaporating liquid on the same hand. Each pupil should gently blow the drops on his hand. With a thermomenter take the temperature of each liquid in the bottles. They should be about the same. Discuss the seeming difference of temperature of the two drops.

The heat radiated from the skin can easily be felt by cool fingers held an inch from the warm skin. In winter the pupil, with a warm scarf around the neck and with bare hands, may play outdoors until he is warm, then remove the scarf and hold the cool fingers near, not touching, the neck. In summer a pupil warm from exercise may cool his hands in water or on ice, quickly wipe them dry, and hold one hand near the skin and the other at arm's length. The difference in temperature is easily noticed.

Section 7. Control of the Body

Using a pointer the pupils should trace the nerve currents in the diagram, HEALTH, page 35. If the diagram is enlarged on the board it would be well to increase the number of brain cells, see HEALTH, page 196.

The ductless gland most easy to exhibit to the class is the adrenal. Get from the butcher a lamb kidney with all the fat around it. A liver-colored gland about the size of the end of the finger will be found near the upper end of the kidney. (See HEALTH, Figure 24, page 31.)

Practical exercises on the topics of the remaining sections of this chapter will be given in subsequent chapters where the topics are developed more extensively.

CHAPTER III

THE TREATMENT OF DISEASE

The preceding chapter gave the pupil a general survey of the working of the body, an organism in which each part coöperates with every other part to provide for the needs of all. This chapter gives a general discussion of the derangements of the body activities, especially of the chief cause of illness, disease germs. After this general survey the pupil will be ready for the detailed consideration of how to preserve, and how to recover health.

Section 1. From Superstition to Science

Let the pupils ask among their neighbors, especially elderly people, and report in class all the sayings and superstitions regarding remedies and curative practices they can learn. Let them bring any charms they can find in use. Discuss these sayings and practices. There may be sense in some of the sayings. The pupils must learn to put everything to the test. If there is doubt about any point, some pupil should take it to a competent physician and get a reliable answer and a clear explanation.

Some pupil should take as a project the life of Pasteur and report to the class. Another should study the life of Lister and report.

Get illustrations of some of the miracles of present day surgery and medicine, of the ways in which modern medical science has made its wonderful progress — by years of most painstaking study, by thousands of experiments, by discarding most of the things tried and preserving only what *proves* valuable. Note that such study has its martyrs, men who have given up their lives in the study and cure of disease,—Lazear, Rickerts, and the pioneers of radium treatment. (References, — 2, 3, 4, 5, page 8.)

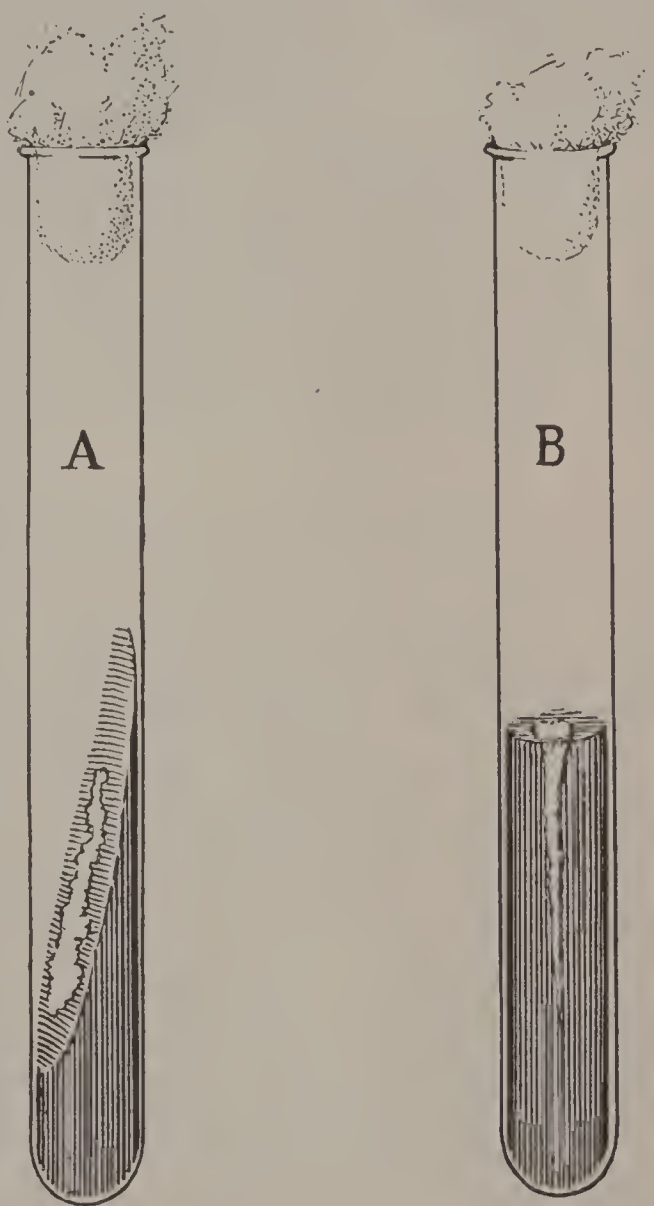

FIGURE 6. — TEST TUBES CONTAINING BACTERIA CULTURES ON BEEF BROTH JELLY. *A*, a surface growth. *B*, a stab culture.

Section 2. Health and Sickness

An easy and pedagogically indispensable exercise is the cultivation of mold, yeast, and bacteria, and their study with and without a compound microscope. The microörganisms can be grown at

home or at school. A potato is convenient for the cultivation of mold and bacteria. Another culture medium, better in some respects than the potato, is beef broth jelly. Directions for preparing the media and for the study of the microörganisms are given in the note-book, page 35.

CHAPTER IV

FOOD

THE preceding chapters have given the pupil a very general understanding of the activities and the ills of the body. He is now prepared to make a detailed study of health as it is presented in this chapter and the chapters following.

Section 1. Principles and Selection

Chemical substances newly discovered or invented are given technical names which indicate more or less completely their chemical composition. The chemical compositions of vitamines (*vita*, life) have not yet been discovered, therefore these substances have received no names but are known as *A*, *B*, and *C*. *A* is commonly found dissolved in fat foods and is therefore called fat soluble *A*. *B* and *C* are in the juices of vegetables and fruits and are water soluble. The existence of a fourth vitamine has just been discovered (1923), and probably further study will reveal still others.

Section 2. Quantity

A great deal of study has been given within the last few years to the weights of children, compared with their heights. Tables have been prepared with great care giving the average weights of children of all years and heights. (HEALTH, page 65.) It is an easy and

desirable thing to bring scales into the classroom and weigh each child, then compare the weight with the standard in the table. The children are always interested and many of them give more attention to their diet in an effort to bring their weight up to the standard.

But too much importance must not be placed on a slight variation from the average. Why should a child care to weigh the exact average? He may be in best health when he weighs five or six pounds less or several pounds more than the average. Do not make the children think that they should bring themselves exactly to the standard average.

On the other hand a deviation of fifteen or twenty pounds from the standard usually means that something is the matter. If a child is under weight it may be that he is underfed. But it may be that something else is keeping him down. Such a child should be examined by a physician and the cause of his slight weight determined. The teacher should make it a point to speak privately with each child who is much under weight; better, send for the child's parents and consult with them. If some cause for the deficiency is found and corrected, the teacher can proceed to help the child build up his weight.

It is not wise for the teacher to urge all children who are under weight to eat more. The problem is not so simple. Perhaps the child needs rest as well as food. Perhaps he needs exercise and fresh air. He may need a special diet. But suppose all the precautions are taken to provide for the special cases, the fact is that most boys and girls should make a gain from month to month

and keep somewhere near the standard. Therefore the teacher should urge a pupil who is much over the normal weight to give up sweets and eating between meals, and pupils under the normal weight to give more care to their general hygiene and especially to their diet.

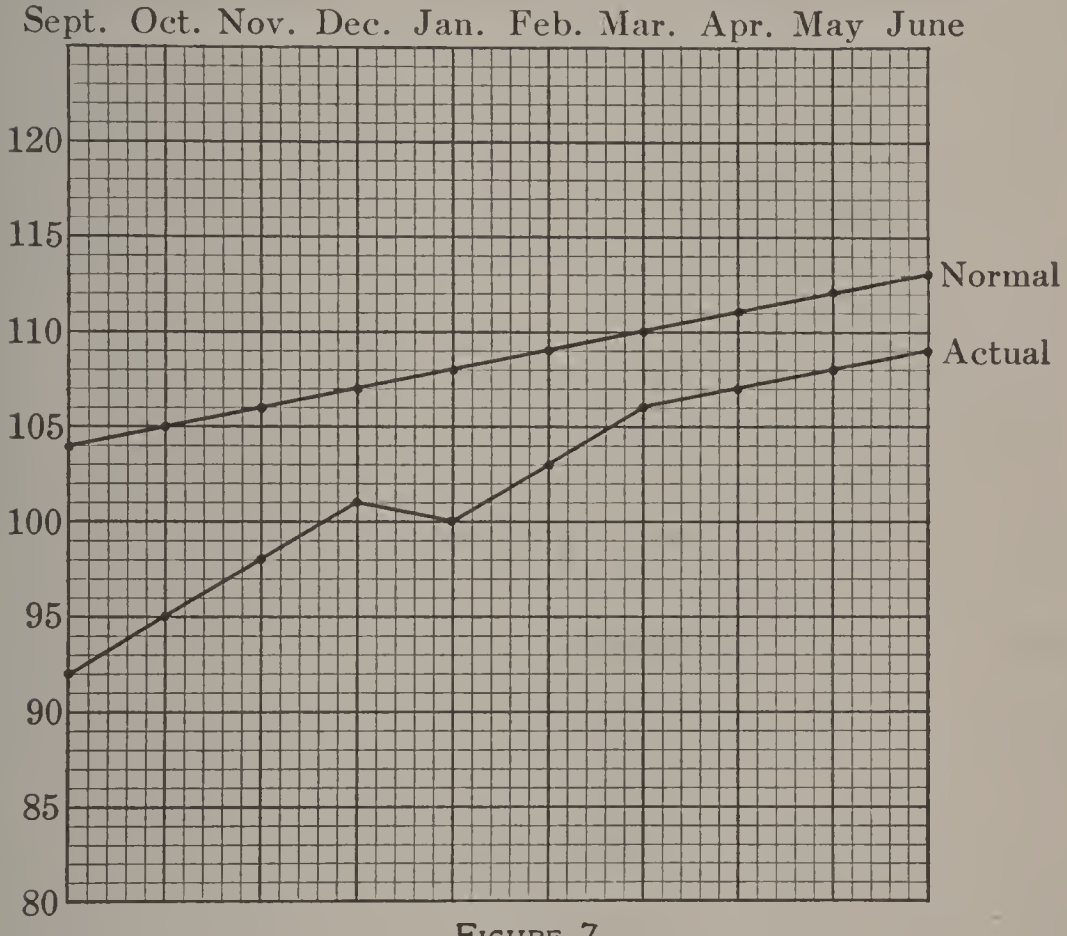

FIGURE 7.

A valuable stimulus to the child to care for his health is the weight graph. For most pupils, taking a weight and marking a graph once a month is sufficient. For those much below the standard there should be a weekly weighing and mark. (Note-book, page 39.)

The graph for a boy 15 years old and 61 inches tall would be as above if he weighs 92 pounds in September,

gains 3 pounds a month until December, loses a pound in January, gains 3 pounds in February and March, and makes a normal rate in April, May, and June.

Section 3. Articles of Diet

To make the classes of food more real to the pupils let them make tests of food to find protein, starch, sugar, and fat. The pupils should bring the food substances from home — flour, milk, cheese, vegetables, cereals, fruits — about an ounce of each. Let them work in groups if there are no conveniences for individual work, with a burner, a test tube, a set of reagents, and specimens of food for each group. If there is no running water at the desk, supply each pupil with an empty glass for waste and a glass of water for rinsing the test tube. The pupils will record the results of their experiments in the table on page 44 of the note-book. Haynes solution turns copper color when boiled with glucose, dark or light depending on the quantity of sugar. Protein boiled in nitric acid turns orange color when neutralized.

The note-book (pages 45 and 46) contains the food table from HEALTH, pages 69 and 70, with two blank columns added, which the pupils are to fill out. The data so obtained will be used in answering some of the questions in HEALTH, page 71, and in making out the menu for dinner. (Question 18, HEALTH, page 72, and note-book, page 48.)

The Table of Food Values is used again in making out the Net Food Table (note-book, page 47) as directed in HEALTH, page 71. It would hardly be profitable to

include all the items of the large table in the Net Food Table. Those called up by the questions on page 71 are used.

Section 4. Care of Food

Under this head a number of interesting problems could be worked up — investigations of what is done in the way of cleanliness in handling food, how foods are preserved, marketed, etc. Let the pupils visit canneries, dairies, markets, or country shipping stations, and report on the excellent devices for caring for foods. Let some pupils question their grandmothers and compare present conditions with conditions fifty years ago. Why does the consumer sometimes pay five times what the producer receives? Discuss wasteful buying, penny-wise pound-foolish, and economy in the kitchen.

Pupils will understand the principle of pressure cookers if they have learned that water can be raised to a temperature no higher than its boiling point. In an open dish, under ordinary atmospheric pressure, water boils at 212° F. When we wish to get a higher degree we heat the water in a tight boiler in which the steam rising from the water presses down on the surface of the water and so prevents its boiling until it has reached a higher temperature — the degree depending on the amount of steam pressure.

Let some pupil keep a bottle of Pasteurized milk beside a bottle of untreated milk for two or three days and report the contrast, if there is any.

A score card can be used to advantage in making some of the food investigations. A market score card

is given in the note-book, page 49. Let pupils score different markets and compare their records. One value of this work is that it fixes in the pupil's mind the qualities of an excellent market and helps to create a demand for more sanitary things.

A pupil can himself make out a score card for the care of food in the home, touching on such points as condition of refrigerator, protection of food from insects and mice, freedom from mold in the bread box and elsewhere, thriftiness in using everything usable, economy in buying, etc.

Sayings and superstitions about the uses of foods — foods that are heating or cooling, foods for brain workers or laborers, eating oysters in the *r* months, foods good for the complexion, foods suitable for spring, for winter, for certain climates, etc., — are not only interesting but also profitable for discussion. Urge the pupils to collect these sayings and bring them to class. Many of the sayings have good reason back of them, while others are faulty and misleading. The pupil should learn to hold an inquiring mind toward them, ready to accept or reject as the evidence indicates. A respectful skepticism, a disinclination to accept rumors without some evidence of their truth, is one of the most valuable traits a pupil can acquire. It is characteristic of an awakening mind.

CHAPTER V

STIMULANTS AND NARCOTICS

Several profitable projects are within the compass of high school boys and girls in connection with the topics of this chapter. A statistical study of the money spent for tobacco compared with that spent in education would be very interesting. A graph would make the report more striking. A history of the temperance movement culminating in prohibition would help us understand where we are. Other good topics are:

The Relation of Crime to Alcohol, Scientific Studies in the Effects of Narcotics.

A history of the opium traffic in China makes a strong appeal.

What is the League of Nations doing about the traffic in narcotic drugs?

What is the United States doing to suppress the illicit traffic in narcotics?

A Survey of Hospitals and Sanatoria for Drug Addicts.

An inquiry among the boys, How I Came to Use Cigarettes, by one of them.

References. — 13, 14, 15, A, B (pages 9 and 11), and magazines and papers on the action of the League of Nations.

The unpopularity of the Eighteenth Amendment in some communities results in its general violation in

these places. While discussing the subject of narcotics the teacher should give a lesson in practical civics. He should make clear the fact that good citizenship requires obedience to laws even though they are unpopular. Legal, not anarchistic methods must be used in seeking relief from laws which we do not like.

CHAPTER VI

DIGESTION

The study of the mouth is a very practical exercise which should be done by every class. It can be performed without expensive apparatus or laboratory room. The work should be individual. (Note-book, page 51.)

The process of digestion can be made real to the pupils if each one digests a little starch in a test tube with saliva from his own mouth. Individual work is preferable. (Note-book, page 55.) The pupils will get some variation in results partly due to differences in saliva.

There is a very significant difference between the wall of the stomach and that of the intestine, which the pupils should see in an actual specimen. Prepare pieces of the small intestine as you did of the stomach (page 19). The directions for study are in the note-book, page 57.

A score card can be used with profit to help the pupil establish good habits with regard to food and digestion. (Note-book, page 59.) One entry a week is perhaps often enough for most pupils; some might make a record every day. The seven items are too many for most pupils to take up at first. It may be well to start with four and add others later. If the inventory is kept for several months the pupil might

make a graph to show whether his total score has improved or not.

If the teacher finds that the pupils do not understand the words acid and alkaline, used in reference to the digestive juices, he would do well to spend a few minutes in clearing up the words by a demonstration. Gather a few substances common in a laboratory — hydrochloric, sulphuric, nitric (acid), ammonia, potash, soda (bases), water, alcohol, salt (neutral substances) — and test each with litmus paper. Let the pupils from their observations come to the conclusions that acids turn litmus paper red, that bases (alkalies) turn litmus paper blue, and that neutral substances do not change the color of litmus. Give a few enterprising pupils pieces of litmus paper to test substances at home and let them report to the class.

CHAPTER VII

THE BLOOD CIRCULATION

No matter how good a diagram of the heart you may have it should be supplemented by the study of the heart itself. Nothing else will give the pupil adequate images of the valves, the muscular walls, the chambers, and the vessels adjoining. The study should be conducted as group work. For each group get from the butcher a lamb pluck (heart, liver, and lungs). If you get only the heart, the auricles and vessels will be shorn away.

Make the seekers by splitting bamboo into strips eight or ten inches long and $\frac{1}{8}$ inch wide, and charring the ends to make them smooth and round. (Note-book, page 61.)

The teacher should cut a hole large enough to admit a finger in each auricle. The right ventricle should be slashed open from the semilunar valves halfway to the apex of the heart, and in the left ventricle a hole cut large enough to admit a forefinger. The pupils should compare the specimen with the diagram in HEALTH, page 113. The questions in the note-book will be a sufficient guide for the work.

The study of the heartbeat (note-book, page 63) is possible for every class. The teacher may hold the watch, start the count, and call time at the end of the minute, then call upon each pupil in turn to announce

his number. After these numbers are recorded the teacher will direct the pupils to stand and exercise briskly to his count somewhat as follows: Arms extended horizontally at side, swing to clap over head, down and up ten times; hands on hips, forward bend the body to horizontal, back to erect, ten times. Pupils sit and immediately count the pulse, noting the number at the end of thirty seconds and also at the end of the minute, then announce the number in turn and all record in the second column of the note-book page.

For getting the sound of the heartbeat pupils are commonly unable to use an ordinary stethoscope, but the Pollard stethoscope ($6) makes the sound quite distinct even through the clothing.

An interesting project in connection with the blood is a study of the mosquito. The pupils should try to find the larvæ and pupæ, small insects that "wiggle" down from the surface when you disturb a dish or pool of water that has been standing several days. In cities they should explore empty lots and back yards, examining cans and other places where water might stand for several days. The catch basins at the street corners deserve attention. In the country the rain barrels, troughs, and puddles are likely to be infested. A regular survey with a public report of the findings would arouse interest.

To test the capacity of the blood to carry oxygen, get from a physicians' supply house a hemoglobin test-book. (Hemoglobin is the coloring matter in the red corpuscle which carries oxygen.) This book contains sheets of standardized blotting paper and a card with

graded shades of red. With a wisp of cotton dipped in alcohol sponge off the lobe of the pupil's ear (volunteers only). When it is dry prick it with a surgeon's needle or other small sharp instrument. Get a drop of blood on one of the sheets of blotting paper and find its corresponding shade in the graded set. The pupil will be interested in knowing whether his blood is normal; but the chief value of the test is that it helps to put the whole subject on a scientific plane and to bring the pupil to the right attitude of mind in regard to health and the treatment of disease.

Let the pupils look in the papers, magazines, and bill-boards for advertisements of blood medicines, then learn what they can about the remedy or its manufacture and report to the class. (References. — 23, 24.)

An attractive library study is the influence of malaria on life in the tropical regions, on the history of Rome and Italy, on the settlement of the Mississippi Basin. Other library studies are: Yellow Fever in Our Southern States, The Cleaning up of Havana; Preparing to Dig the Panama Canal. In connection with them would be the biographies of Gorgas, Reed, and Lazear. (References. — 4, 5, 6, and Medical Who's Who.)

CHAPTER VIII

AIR AND THE BREATHING ORGANS

CILIA (HEALTH, page 126) can be demonstrated easily under a compound microscope. Get a live clam, either a fresh or a salt water species, break open the shell, with scissors snip off a piece of the gill and mount it in water. If you use a salt water clam, mount the piece of gill in the salt water contained within the shell. A $\frac{1}{8}$ inch objective will show the cilia in motion. If the cells are nearly dead the motion is slow and the details clearly seen; but the rapid motion of vigorous cells also should be studied. Let the pupils describe what they see. A drawing is hardly possible unless the action is abnormally slow.

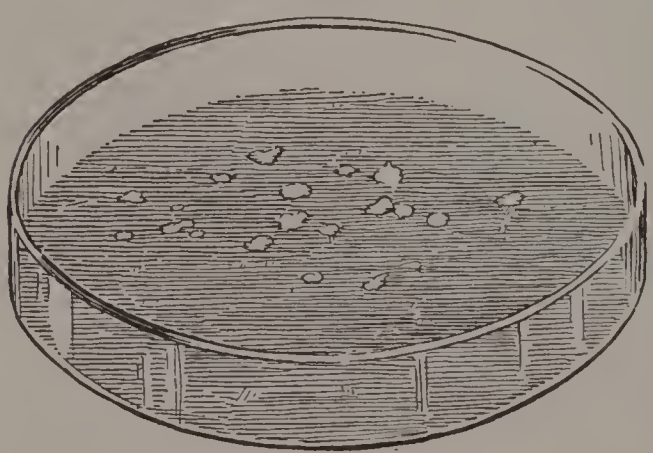

FIGURE 8. — A PETRI DISH.
Showing a plate culture of bacteria.

To make the dust in the air of the room apparent, throw a beam of light through the darkened room. To show that the spores of mold and bacteria are in this dust, expose a culture medium (food substance for bacteria) for five minutes then cover it up; examine it after it has incubated for a day or two. To prepare a culture plate, warm a beef-

broth jelly-tube (note-book, page 36) to melt the gelatine, pour it into a sterile Petri dish (a flat glass dish with a cover) and cover immediately. The jelly will set in a thin layer over the bottom of the dish. To expose the dish to the dust the cover is removed for a measured time then replaced. The number of live germs which settle in the dish can be told by the number of colonies, spots, which appear on the jelly within a day or two.

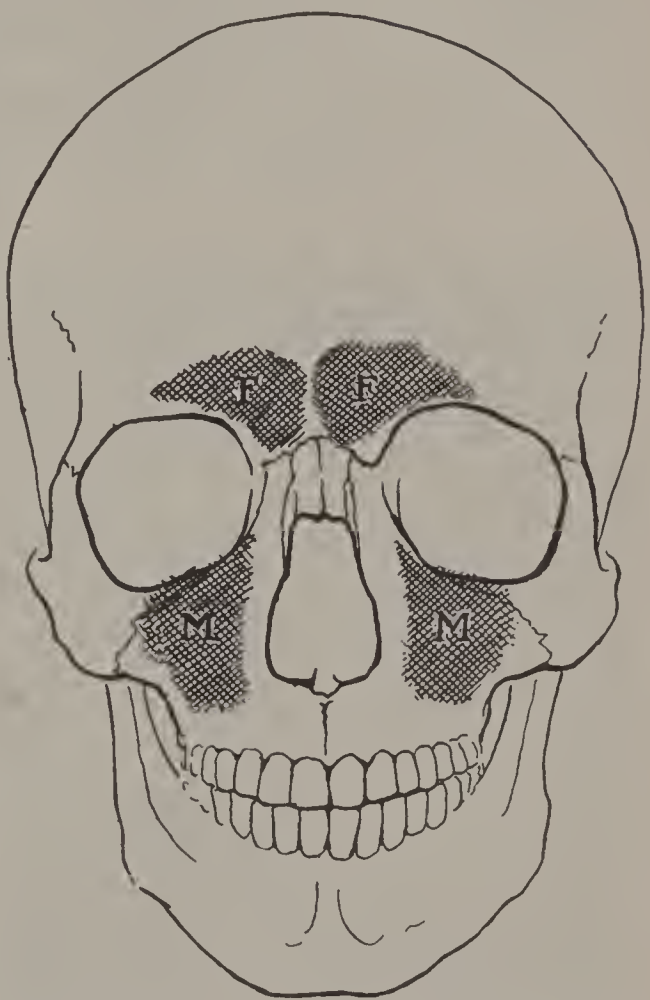

FIGURE 9. — THE SITUATIONS OF THE SINUSES.

F, Frontal sinus. *M*, Maxillary sinus.

So many people suffer from sinus trouble that it is well to demonstrate to the pupils the sinuses of the skull. If the teacher does not wish to saw the human skull which is provided for bone study, he can get a sheep or calf head and with a saw or chisel open the frontal sinus and the antrum (maxillary sinus) (HEALTH, pages 125 and 127). In the fresh specimen the mucous membrane which lines the sinuses will show. To avoid

the work of preparing a fresh specimen each semester the head can be preserved in a three per cent formaline solution, or the cleaned and dried skull used.

Interesting projects concerning the air we breathe are studies of the disposal of dust in factories, and of smoking chimneys. For the latter let the pupils choose a few large buildings — the schoolhouse, an apartment, a factory — and observe at certain hours whether there is much, little, or no smoke from the chimney of each. The record should be kept for several days and written up as a table. The pupils should visit the building and talk with the engineer or stoker and try to find the reason for the presence or absence of smoke. Some pupil may be able to learn and to explain to the class the principle on which smoke consumers work.

In visits to a few factories a pupil will probably learn what devices are used to protect workmen from the dust produced in the work, whether the workers wear masks, or whether the machines have exhaust fans for removing the dust produced in their operation.

During the spring and fall the pupils will probably be able to bring in flowers whose pollen causes hay fever in some people. A compound microscope ($\frac{1}{8}$ inch objective) will show many beautiful and interesting details in the grains. A few slides should be prepared for the season when flowers are not available. To make a permanent preparation sprinkle pollen grains on the slide, wet them with a drop of xylol or chloroform, put on a drop of balsam and a cover-glass.

In the study of ventilation begin with your schoolroom. How does the air get in? How get out? If

you have an anemometer, measure the quantity of air which is forced into the room in an hour. What is the means of heating the air in cold weather?

As home projects let the pupils investigate the ventilating and heating devices in their homes, in churches, theaters, factories, or any buildings accessible.

The pupils are interested in measuring their own breath. The spirometer which is used in testing the lung capacity of pupils in physical training is a convenient instrument. If you can not get one, invert a gallon bottle (231 cubic inches) full of water in a pneumatic trough and let a pupil exhale through a tube into it. A single breath is likely to be forced; therefore, direct the pupils to take the average of five successive ordinary breaths. When they do not force the breath they get between 15 and 30 cubic inches for a breath, the taller the pupil the larger the breath. Every pupil should disinfect and rinse the mouthpiece before using it. A three per cent formaline solution is a good disinfectant. (Note-book, page 65.) This exercise also

FIGURE 10. — A HOME-MADE SPIROMETER.

relates the pupil's own breathing to the ventilation of the room.

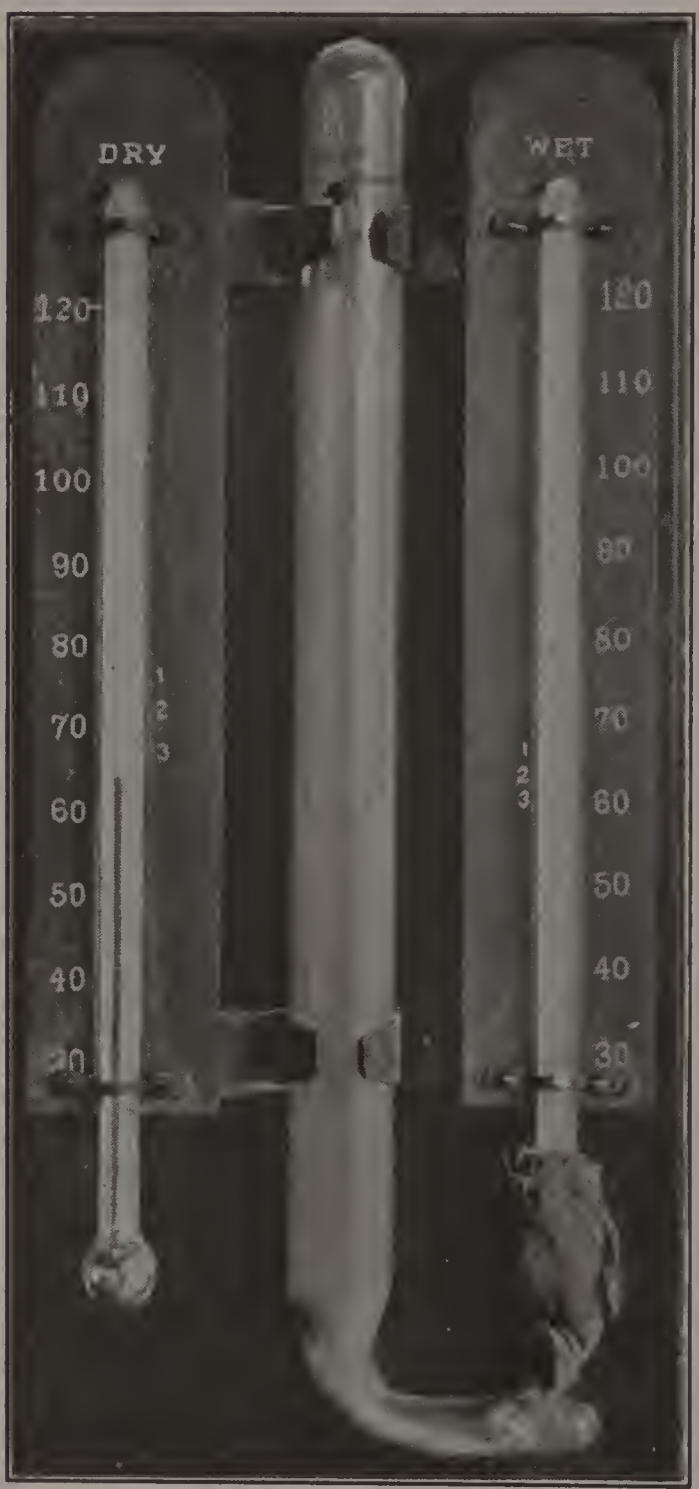

FIGURE 11. — A PSYCHROMETER WITH A WATER SUPPLY TUBE.

To determine the humidity of the air use a psychrometer, a pair of thermometers, one bulb wet. If you have none, ascertain the temperature of the room, then put a wet rag about the bulb of the thermometer and fan the instrument till the mercury will drop no more. Read the temperature. Get the difference between this reading and the temperature (dry bulb) of the room and use this difference in getting the relative humidity. (See the note-book, page 67.)

If there are any

fresh air schools or fresh air rooms in your community, let some of the pupils visit them and report to the class. Otherwise, let them read the story and report. (References. — 20, H, pages 9 and 11.)

A good laboratory exercise is the study of the pupil's own breathing, of the movements and the muscles which produce them. First observe each pupil as he stands or sits erect to be sure that he has the diaphragmatic movement (HEALTH, page 144). When he has the correct breathing let him observe his own movements and answer the questions of the exercise in the note-book, page 71.

CHAPTER IX

THE KIDNEYS

A MENTAL image of a kidney very like that of man can be acquired by studying the pig's and the lamb's kidney. Pigs' kidneys are sold stripped of their covering of fat and more or less mutilated by the inspector's

FIGURE 12. — SLICING A PIG'S KIDNEY.

knife. They can be bought in abundance at the stockyards and markets. Lambs' kidneys are sold in the carcass and can be had of the butcher in small quantities and covered with the fat. Slice some of the kidneys in two from the hilum to the opposite edge. Keep some specimens of lambs' kidneys entire and covered

with the fat. The pupils should work individually. (Note-book, page 73.)

Tests of urine are valuable exercises for pupils who take it in the right spirit. The experiment helps them to get the scientific attitude of modern medicine and to divorce themselves from the old notions of mystery and superstition in treating disease. However, it is best to omit these tests in mixed classes, or where they may cause embarrassment.

The sugar test is made by boiling a little urine with Haynes solution, as in the food test. (Note-book, page 42.) The teacher may have to get a sugary specimen from a physician, since the specimens obtainable from the class will probably be free from sugar.

For the albumen test half fill a test tube with urine and run under it through a glass tube a little strong nitric acid. If albumen is present, a white layer will form at the junction of the liquids.

CHAPTER X

THE SKIN

No pupil should omit the study of his own skin, a laboratory material always at hand. (Note-book, page 75.) The leather given the pupils should be *torn* to show the fibers of which it is composed.

Show the pupils how to remove a blackhead by pressing a tiny ring around it instead of squeezing a large fold of skin. If a pupil has a painful boil or other swelling of the skin, show how the pain can be relieved by a hot application, — a wet compress, a hot water bottle, or an electric light on a cord.

Let the pupils collect and bring to class advertisements of skin treatments and remedies. Take pains to distinguish between the lotions and creams which are usually harmless and may be beneficial, and the remedies which profess to cure diseased skins. In the latter point out the characteristic marks of chicanery in the style and substance of the advertisement. Of course some skin diseases are cured by advertised remedies.

Let each pupil make out a score card showing his own status as to the condition of his nails, the presence of corns, warts, and pimples, the fit of his shoes and stockings, and his bathing practices. After two months let him make out another card and note the points of improvement. (Note-book, page 77.)

The judicious teacher can do much to influence pupils to dress hygienically and to take proper care of their nails. When the teacher has won the confidence and esteem of the pupils, a few words in private expressing an earnest wish to see improvement in a certain particular — feet or chest more warmly clad in cold weather, low heels instead of French heels, nails well manicured — will often produce the desired effect. It is well to specify a definite time for the reform: "I hope to see you wearing shoes with sensible, roomy toes tomorrow." "Before the end of this month will you not show me a hand with shapely finger nails?" Gnawing or tearing finger nails back to the quick is a bad habit very common among children, even high school children from good homes.

CHAPTER XI

BONE AND MUSCLE

The chief points of practical value in this chapter are posture and exercise. Let the pupil keep a score card for several weeks, recording his practices by making a check mark for satisfactory observances and a zero for failure. (Note-book, page 79. References for posture. — 19, 20, D, I, pages 9 and 11.)

Example is a potent factor in the formation of habits. Not only must the teacher stand and sit erect in the presence of the pupils, but he must lead them to observe and admire the beautiful carriage of other people, and to recognize in this form of the body the expression of admirable qualities of mind. The pupil must not imitate the postures of others. If he does he will be likely to catch their eccentricities. But he should try to acquire their poise, dignity, and benevolence of mind, which will suitably express themselves in the pupil's own carriage.

The teacher can hardly make too much of the thought that the carriage of the body expresses character. The most beautiful carriage expresses self-respect as well as esteem for others. The pupils must be treated in such a way as to develop their self-respect. It is easier to tone them down from an over-weening self-esteem than to arouse a decent pride that will make

them hold up their heads and chests. Therefore take every opportunity to make them feel their own worth.

To give the pupil clear and accurate images of joint structures get several joints of beef and veal from the meat market, saw each in two lengthwise, and give them to the pupils to study. Group work is recommended. (Note-book, page 81.) The observance of the movements of their own joints is a very important part of the exercise.

CHAPTER XII

THE NERVE SYSTEM

Simple practical exercises on the brain and spinal cord are essential to give the pupil a few visual images to put behind the words he has already learned and will learn. (Note-book, pages 85 and 87.) Group work is recommended. Get, if possible, sheep's heads that have been chilled but not hard frozen; freezing softens the brain too much. Remove the tongue and, with a carpenter's saw, saw the head into right and left halves. Rinse off the sawdust. When the pupils are through with the material take out the best specimens of brain and preserve in three per cent formaline for use next semester. Also in a warm room dry some of the half skulls with the *dura mater* (the membrane which incloses the brain) in place.

For the study of the spinal cord, trim the muscles off a sheep's neck, saw a notch lengthwise one half an inch each side of the middle line, and remove the dorsal arches so as to expose the cord. Also get an obliging butcher to split a calf's carcass a little one side of the middle and slice off for you a strip of the spinal column containing the cord uninjured.

The teacher may well demonstrate under the compound microscope a few brain or cord cells with their axons (threads which carry the current out from the

cell) and dendrites (root-like branches which bring the current into the cell).

A plaster model of the human brain is desirable, to give the correct proportions of the cerebrum and cerebellum.

In any large group of students will be found a few who, in their earnestness, sit up too late at night in order to get their lessons perfectly. The study of brain hygiene should take the practical form of devoting sufficient time to rest and sleep. The teacher would do well to learn the sleep habits of his pupils and substitute in the minds of some who are more ambitious than discreet the ideal of health and strength for the ideal of great knowledge attained by burning midnight oil.

CHAPTER XIII

EYES AND EARS

The similarity of the eye to the camera makes the study of that instrument a valuable preliminary to the study of the eye. Let some pupil bring his camera and demonstrate its parts and how they work.

Though the pupil has looked at his eye in a mirror thousands of times he has never observed it understandingly. That is the reason for the exercise in the note-book, page 89. A pig's or sheep's eye is satisfactory for cutting open. Preserved specimens are likely to be somewhat misshapen and the lens and cornea rendered opaque, but they should be used if no fresh material is accessible.

The teacher can demonstrate the function of the cornea and lens by using two or three reading glasses of differing focal lengths, or condensers from the stereopticon. A sheet of thin paper makes a good retina. An electric light is a convenient object. When you have got the focus of the object at one distance, move it to another distance and show that a lens of different curvature is required to bring its rays to a focus at the same place.

It is part of the teacher's function to coöperate with the home in caring for the pupil's eyes. If pupils are neglecting to do anything for eyes which are out of alignment (strabismus) or which are not able to

function adequately, the teacher should arrange a consultation with the parents and show them the desirability of remedying the defect. In some cases the parents are ready to have the matter attended to but the pupil is reluctant. The teacher's job is then, by argument and appeal and all the arts of persuasion, to win the pupil to the desired course. He must not simply advise the pupil and then wash his hands of the matter. The pupil's welfare is in his keeping and he is not released from the responsibility until he has done everything possible for the child's good.

CHAPTER XIV

SOME COMMUNICABLE DISEASES

The material of this chapter invites to library work and surveys. The following topics are suggested:

How smallpox has been driven out of the enlightened parts of the world by vaccination. Compare the epidemics of the disease two hundred years ago with present outbreaks. Use graphs.

How epidemics like smallpox and measles depopulate a country, — the Amazon valley, American Indians, Yucatan, etc.

Typhoid before and after the discovery of preventive hypodermic injections.

Diphtheria with and without antitoxin. Description of a typical case of each.

A land free from diphtheria — how freed?

Tetanus in the Civil War, and in the Great War, 1914–1918.

Rabies, the story of the Pasteur treatment, discovery and early use, present widespread use.

Tuberculosis, whom it attacks, picture of its destruction, how it may be avoided.

Tuberculosis, short history of changes in treatment, eventuating in modern sanatoria.

References. — 1, 6, 7, 8, 9, 10, 11, 12, page 8.

An examination of soft drink parlors in the community, to note the sanitary and unsanitary practices,

will help to raise the health standard of the neighborhood. (Score card in note-book, page 93.)

Candy stands on the streets may be studied in a similar way, noting particularly the cleanliness of the attendants and protection of the goods from flies and dust.

A survey of hairdressing shops may be made to note the cleaning and disinfecting of implements and the use of fresh towels on each patron.

CHAPTER XV

SAFETY FIRST

Let the pupils all watch for one week and report all the dangers they observe and how to avoid each. For suggestions take the paragraph heads in Health. Write in the note-book a summary of the report. (References. — G, page 11.)

Let the pupils comment on the accidents they see reported in the papers, indicating what should have been done in each case to avoid the accident.

In some cities a few of the older schoolboys stand at street crossings near the school, where no policeman is stationed, while the children are arriving or leaving, and assist the pupils, especially the younger ones, safely across. They keep the children back on the sidewalk until there is a gap in the traffic, then conduct them across in a group. The boys temporarily wear badges which correspond to policemen's chevrons, and they are recognized as valuable safety officers. Of course they exercise no control except over the children, but drivers generally regard their uplifted hand as they conduct their groups across the street. Such a squad of boys might well be organized in any school, but they should be carefully instructed how to keep their charges and themselves out of danger, and should be supervised.

CHAPTER XVI

IN CASE OF ACCIDENT

The teacher should have some instruction in first aid so that he will know how to direct the children in practical exercises in bandaging, caring for a broken bone or sprain, stanching bleeding, and producing respiration artificially. (See Boy Scouts' Manual.)

Let one pupil play the patient with a broken leg; other pupils care for him. Again, let some pupil play his arm is broken, and let another pupil put it in a sling. Another pupil may have a sprained ankle or wrist and may be cared for by a companion. The pupils should practice putting on the more simple bandages until they can do a fairly neat job. They should be questioned to see that they understand the reasons for all the directions given in their note-book, page 95. The directions will be more easily comprehended if the teacher demonstrates while a pupil reads aloud. The pupils afterward go through the processes themselves. A demonstration by the teacher will be sufficient for the use of adhesive tape. It is rather expensive and mussy to have the pupils practice with it.

Sufficient directions for stanching bleeding and for artificial respiration are given in Health, pages 250 and 255. The pupils should practice artificial respiration on one another under the teacher's supervision.

They will be inclined to work too rapidly and to put too little muscle into the operation. The exercises on bandaging are the only practice they need for stopping bleeding.

The teacher should invite pupils who at any time are in need of temporary dressings or first aid to come to him that he may demonstrate before the class the method of applying it.

The directions for the use of antiseptics given in HEALTH, page 256 and following, should be supplemented by practical exercises. If the pupil simply reads about the antiseptics, the drugs seem strange, forbidding things. If he handles them, he will feel a sense of command over them which will encourage him to use them when the need arises.

Let the pupils make an applicator by twisting a wisp of cotton around the end of a small stick, dip it into a bottle of iodin, and "paint" a spot on the skin. Let them handle bottles of phenol and lysol, make solutions and disinfect hands, cloths, and instruments. Let them see how easily an antiseptic tablet dissolves and how convenient it is. Let them make a saturated solution of boric acid in boiled water and apply it to the eye with a wisp of absorbent cotton. The pupils should read on each bottle the conspicuous poison label, the antidote, and the cautions to be observed. This will lead them to take proper care of the drugs in their own homes.

CHAPTER XVII

THE HEALTHFUL HOME

THE project work in this chapter will be chiefly library study and "field" work. (References. — 25, 26, 27, 28, 29, page 9.)

Pupils living in cities and large towns can report to the class particulars in which their own community would be improved by the practice of zoning. Perhaps some would have initiative sufficient to make a map and devise a zoning scheme for the city or their own neighborhood.

Whether in the city or in the country all pupils should be able to point out excellencies and defects in the situations and constructions of the homes, the schools, or the camps they have been in. Let them take the topics discussed in HEALTH, chapter XVII, for a guide in their observations and reports. The most important feature of the work is *practicable* suggestions for improvement.

An interesting exercise is for the pupils to choose a home site in the school district. In the city this would usually mean picking a flat to rent. In the country it would mean selecting a place to build. The pupils should give reasons for their selections, guided by the discussion in HEALTH, pages 264 to 266. Let some enterprising pupils plan the arrangement of

rooms of a proposed house and explain their design to the class. If several such designs are presented the class will choose the one which best meets the needs of a home, — health, economy, beauty, convenience.

CHAPTER XVIII

THE GOVERNMENT AND HEALTH

The supplementary work of this chapter will be library and field studies. In all projects the influence of the institution studied on the health of the community should be made clear. The excellences as well as the shortcomings should be pointed out.

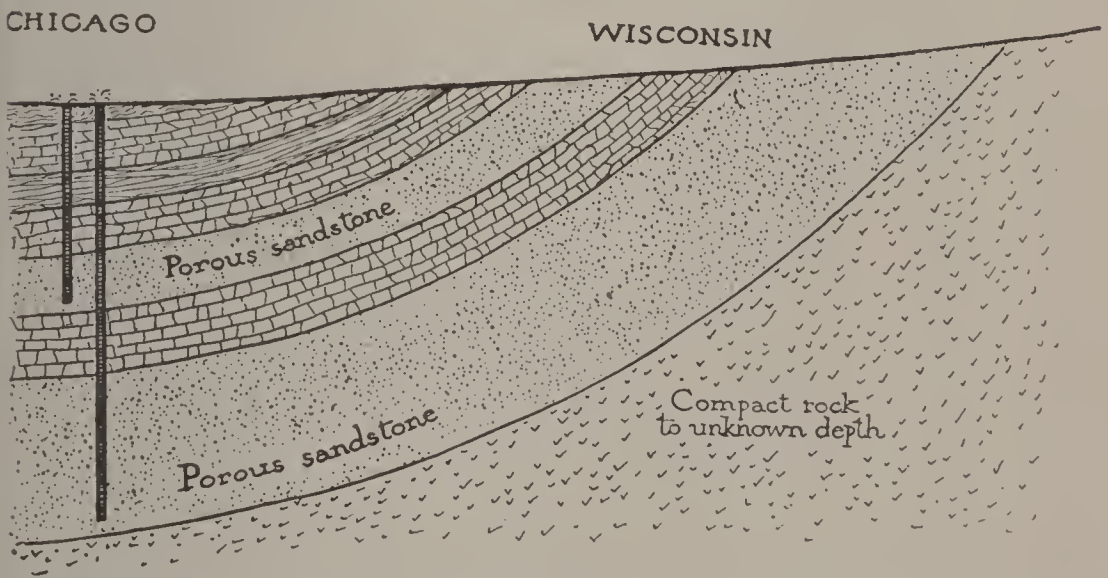

FIGURE 13. — DIAGRAM OF THE ROCK STRUCTURE WHICH SUPPLIES THE ARTESIAN WATERS OF NORTHERN ILLINOIS.

Some pupil should give a description of the local water supply. Those who have lived in other cities or in the country should report on the water supplies of the places in which they have lived.

If your school is in a city where there are food inspectors, a small group of pupils should get permission to accompany the inspector on some of his visits and

should report to the class on the process of inspecting and on the conditions of markets, storage warehouses, packing houses, etc.

Sanatoria and hospitals are usually glad to receive visitors in the non-contagious wards. Pupils visiting them with a view to reporting to the class should have in mind some definite features to observe, — cleanliness and the means thereto, ventilation, temperature, conveniences for moving bedridden patients, provisions for meals, and all sorts of conveniences for meeting the needs of patients. The needs of the institution, what people can do to make its work more efficient, should be reported.

In many schools the pupils will have had experience with school doctors, dentists, or nurses. They should report what good work of these officials they have observed. All pupils could mention some occasion when the service of a doctor, dentist, or nurse would have been valuable. A debate might be held on the amount of such service which the school should accept. Should the doctor's duties be confined to inspection, keeping out of school infectious cases, or should he also advise and treat those who need medical attention? Should the dentist only examine and report the condition of the teeth, or should he also treat them?

In some communities the children will be able from their own observation to give information about child labor and sweated industries. In others they will have to depend on their reading. The discussion should make clear the differences between the home duties,

whose faithful performance is a valuable part of the child's education, and the burdensome labor which stunts the physical and mental development of children. The poverty-ridden parts of large cities have always harbored sweated and child labor, but market gardens, fruit and vegetable packing factories, sugar beet raising, and oyster packing have also become the bane of child life. In what ways are these and some other industries inimical to childhood?

Parks and playgrounds have become so widely established that in a great many communities the children will know them from personal experience. Let the pupils point out the features they have found most valuable and make suggestions of improvements which would more fully meet their needs. For pupils who have had little experience with these institutions there is plenty of reading matter, and always the opportunity to say what they would like to have, — and to work for it with increasing efficiency as their powers increase.

The opportunity to study "patent medicines" from newspapers and bill boards is altogether too abundant. Let the pupils collect all the advertisements of such nostrums that they can. Read and discuss a few of them in class and see how alike they are in style and in their claims. They have the same psychological appeal, no matter what the disease. Let different pupils look up the facts about various frauds and report to the class. (References. — 16, 17, 18, 21, 22, 23, 24, 30, 31, C, E, F, pages 9 and 11.)